PROGRESS REPORT ON PRINCETON UNIVERSITY

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In the course of the last six months an attempt has been made to devise calibration curves to permit semiquantitative estimation of the proportion of glass to crystals in volcanic rocks. This is considered a major problem because of the possibility that lunar maria may be composed of lava flows, which, from a petrologic point of view, are essentially glass crystal assemblages.

The diffraction patterns of natural rhyolitic glass were examined with different X-ray parameters to determine the best way of studying the broad statistical maximum typical of glasses. This maximum is obscured by the peaks of the different minerals in glass-crystal mixtures so that detection of the intensity of the maximum becomes more difficult as the quantity of the glass in the mixture decreases.

It was found that the simplest way of measuring the amount of glass in a glass-crystal mixture was by determining the height of the intersection of straight lines drawn through the two slopes of the maximum. Mixtures of quartz, sanadine, oligoclase and biotite with varying amounts of rhyolite glass were prepared and a calibration curve plotted from more than 100 X-rays which were scanned from 48° to 6° at 1°/min. The mixture of crystals and glass corresponds to the mineralogy of rhyolitic lava flows, which have the greatest glass content of any lava type rock. The result was essentially straight line graph, though runs with 5% and 50% glass did not fit the line well. To test the calibration, three mixtures with variable amounts of glass were prepared and X-rayed. The first, with 23% glass, fitted the curve perfectly, the rest showed large discrepancies. Two mixtures with 15% glass were used to check the previous determination for this part of the graph and fell well outside of the previous position. This

happened again when the value for 25% glass was twice rechecked. The check on the 50% point also showed considerable change. Since the Cu X-ray tube utilized has a rating of Kv50 Ma20 and was being kept at Kv50 Ma25 to increase the glass maximum it was thought that the lack of good reproducibility was caused by excess wattage. A single powder mount of 100% glass was then X-rayed continuously for five days to observe reproducibility. It was found that errors in the height of the diffraction maximum were so large as to preclude semiquantitative determinations of glass.

A high intensity copper tube with a rating of Kv50 Ma40 was then acquired and is now being utilized to construct a new calibration curve. Five points for a new curve (see figure 1) have now been plotted and it is hoped that reproducibility will have improved.

Crystals in mixtures have not been kept at fixed proportions, since this would entail the elaboration of an infinite series of curves.

G. Otalora
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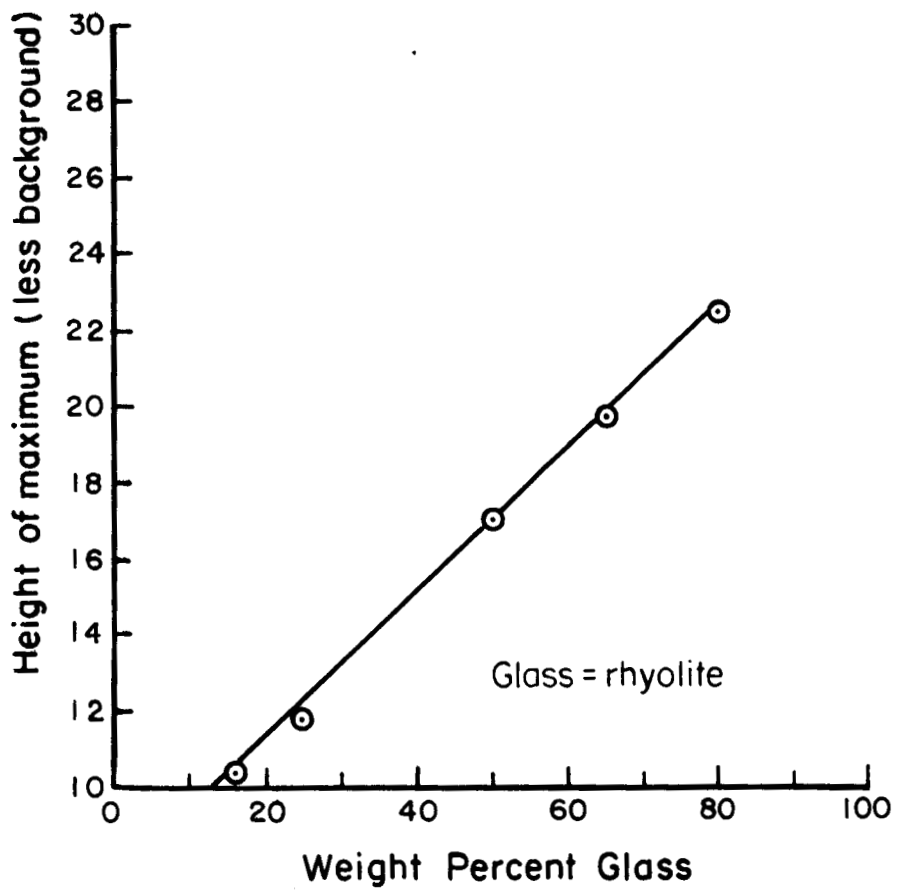
CRYSTAL — GLASS MIXTURES (tentative)

Height of glass diffraction maxima vs glass content

(High intensity tube)



Diffraction x-ray parameters

Radiation	CuKα
Beam voltage	50 kv
Beam current	25 ma
Detector	Proportion
Detector voltage	1650 v
PHA baseline	as required
Scan rate	1°/min
Time constant	8
Divergence slit	1°
Receiving slit	0.006 in.
Anti-scatter slit	1°
Scale factor	X 200

High intensity Cu tube

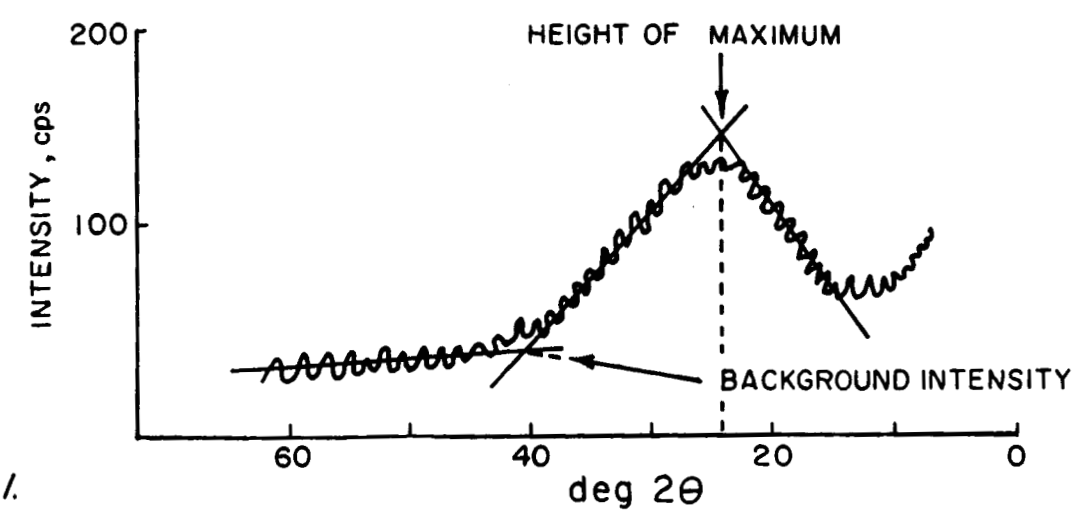


Figure I.